

L4: Phase Diagrams

30 Jan. 2017

The System LiF-KF. See Fig. 2. Source: A. G. Bergman and E. P. Dergunov, *Compt. Rend. Acad. Sci. URSS* 31:753 (1941). $E = 492^\circ$, 50% KF.

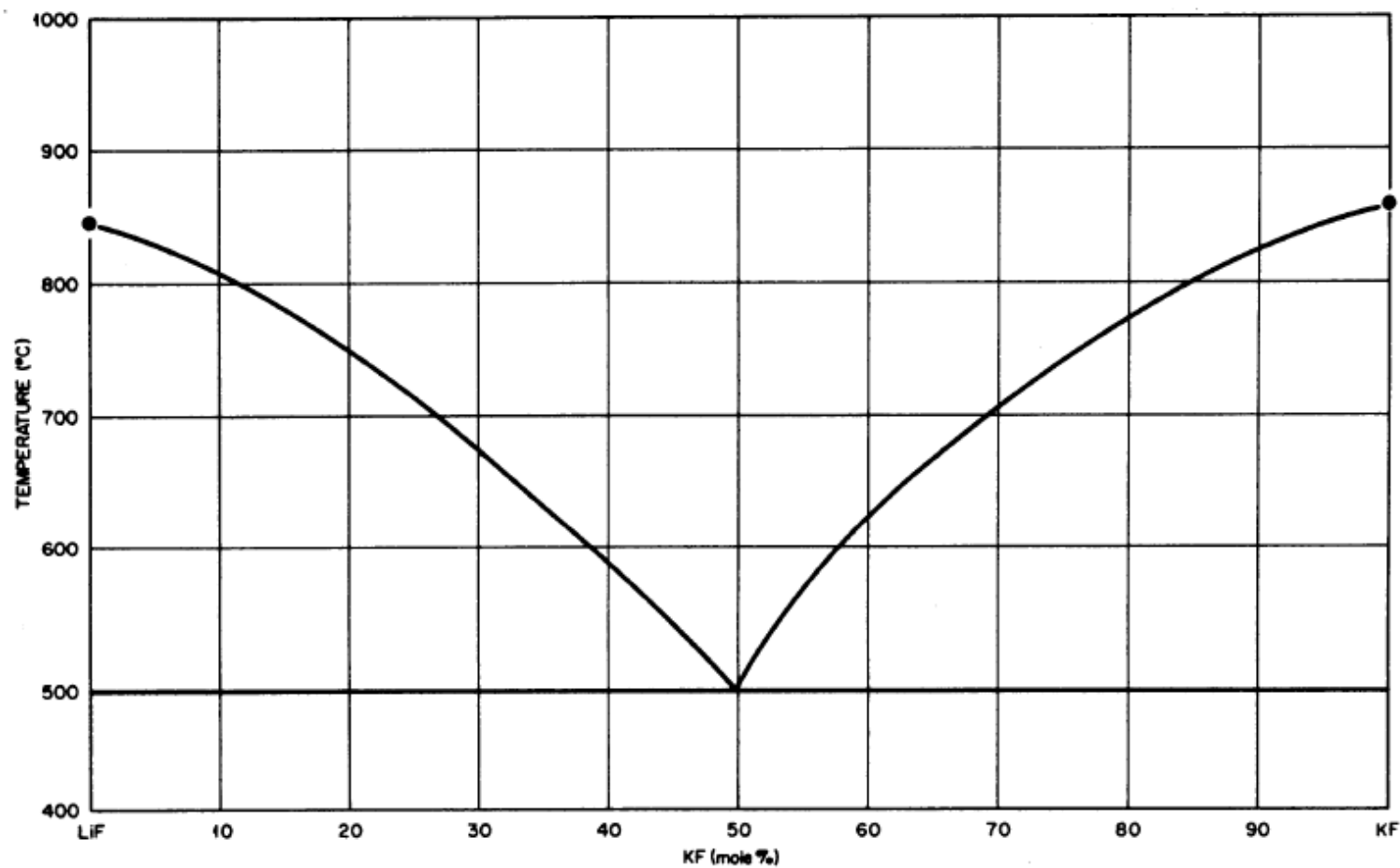
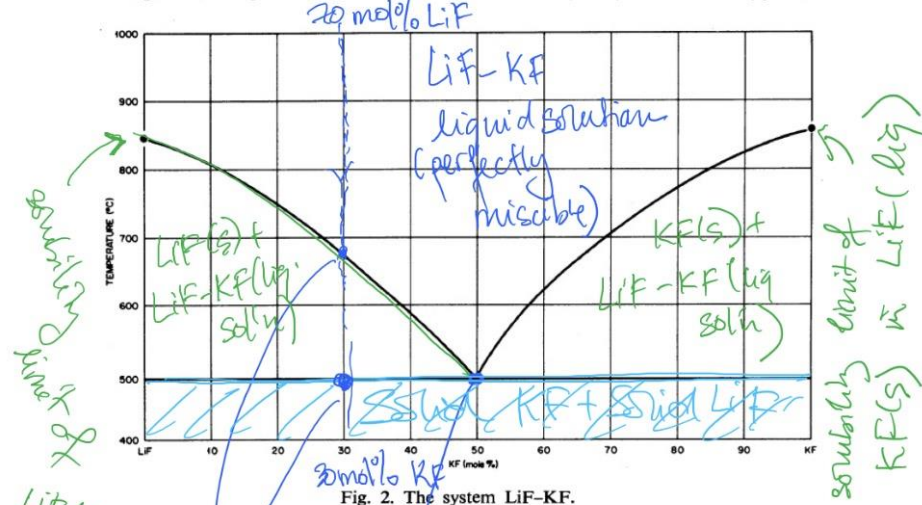


Fig. 2. The system LiF-KF.

The System LiF-KF. See Fig. 2. Source: A. G. Bergman and E. P. Dergunov, *Compt. Rend. Acad. Sci. URSS* 31:753 (1941). $E = 492^\circ$, 50% KF.



solubility limit of LiF(s) in KF(lig)

solubility limit of KF(s) in LiF(lig)

liquidus point for 30 mol% KF composition.
 $\text{LiF (sol'n)} \rightarrow \text{LiF (s)}$

eutectic point
 $\text{LiF-KF (lig sol'n)} \rightarrow \text{LiF (s)} + \text{KF (s)}$

solvus point for 30 mol% KF composition
 $\text{KF (s)} + \text{LiF (s)} \rightarrow \text{LiF (s)} + \frac{\text{LiF-KF (lig sol'n)}}{2/5}$
 remains as $\frac{2}{5}$ LiF solid, and gradually dissolves as temp \uparrow to the liquidus point
 $\frac{3}{5}$ converts to solution @ the solvus line

Concepts

1. Solidus line
2. Liquidus line – crystallization path – solubility limit – liquid-composition variation with cooling
3. Tie-lines – lever rule
4. Solid solution vs. no solid solution

The System LiF-KF. See Fig. 2. Source: A. G. Bergman and E. P. Derguncov, *Compt. Rend. Acad. Sci. URSS* 31:753 (1941). $E = 492^\circ$, 50% KF.

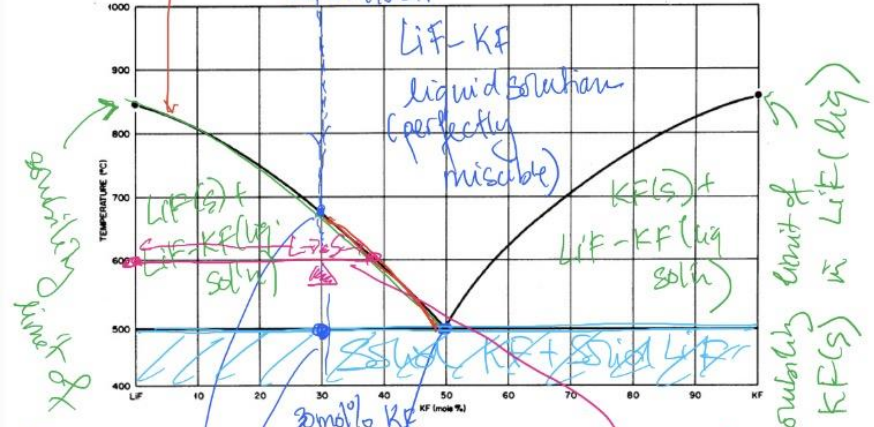


Fig. 2. The system LiF-KF.

liquidus point for 30 mol% KF composition.
 $\text{LiF (sol'n)} \rightarrow \text{LiF (s)}$

lever rule:
 $\frac{\text{mol liq}}{\text{mol solid}} = \frac{L}{S}$

eutectic point
 $\text{LiF-KF (liq sol'n)} \rightarrow \text{LiF(s)} + \text{KF(s)}$

solidus point for 30 mol% KF composition
 $\text{KF(s)} + \text{LiF(s)} \rightarrow \text{LiF(s)} + \text{LiF-KF (liq sol'n)}$
 remains as $\frac{2}{5}$ LiF solid, and gradually dissolves as temp ↑ to the liquidus point
 $\frac{3}{5}$ converts to solution @ the solidus line

Concepts

1. Multiple solid phases
2. Eutectic
3. Peritectic
4. Metastable eutectic

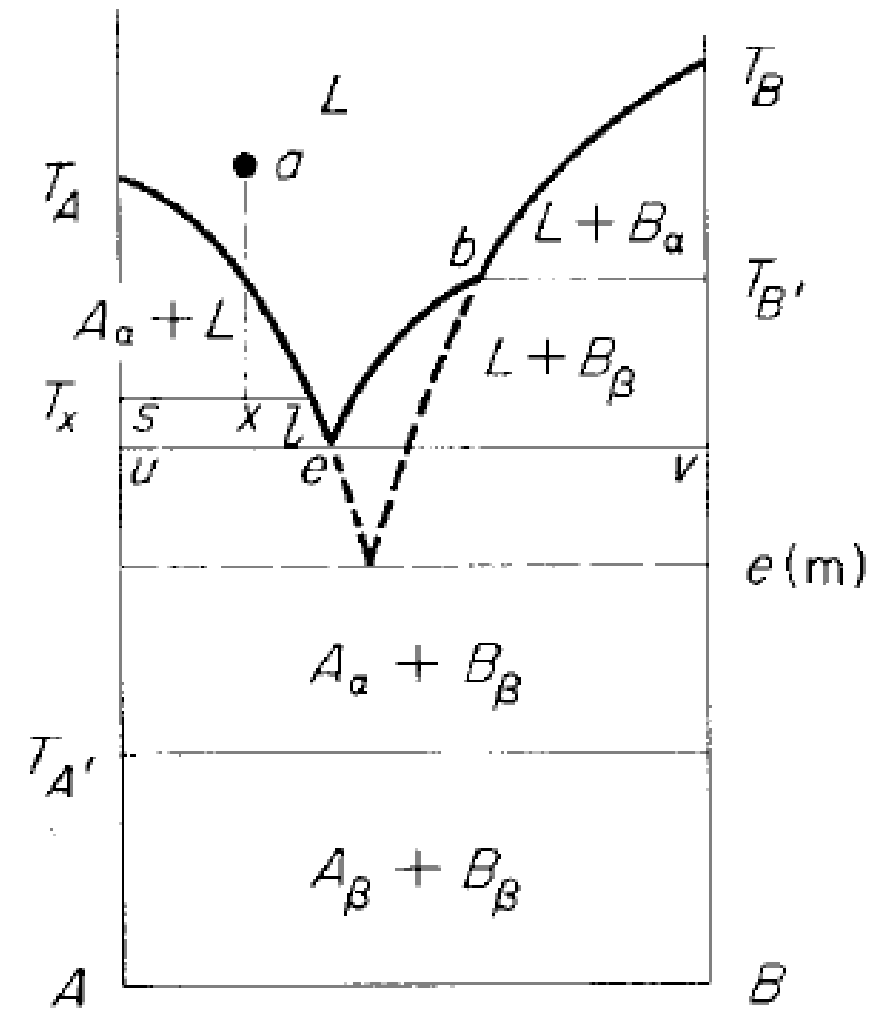


Fig. 1.1.

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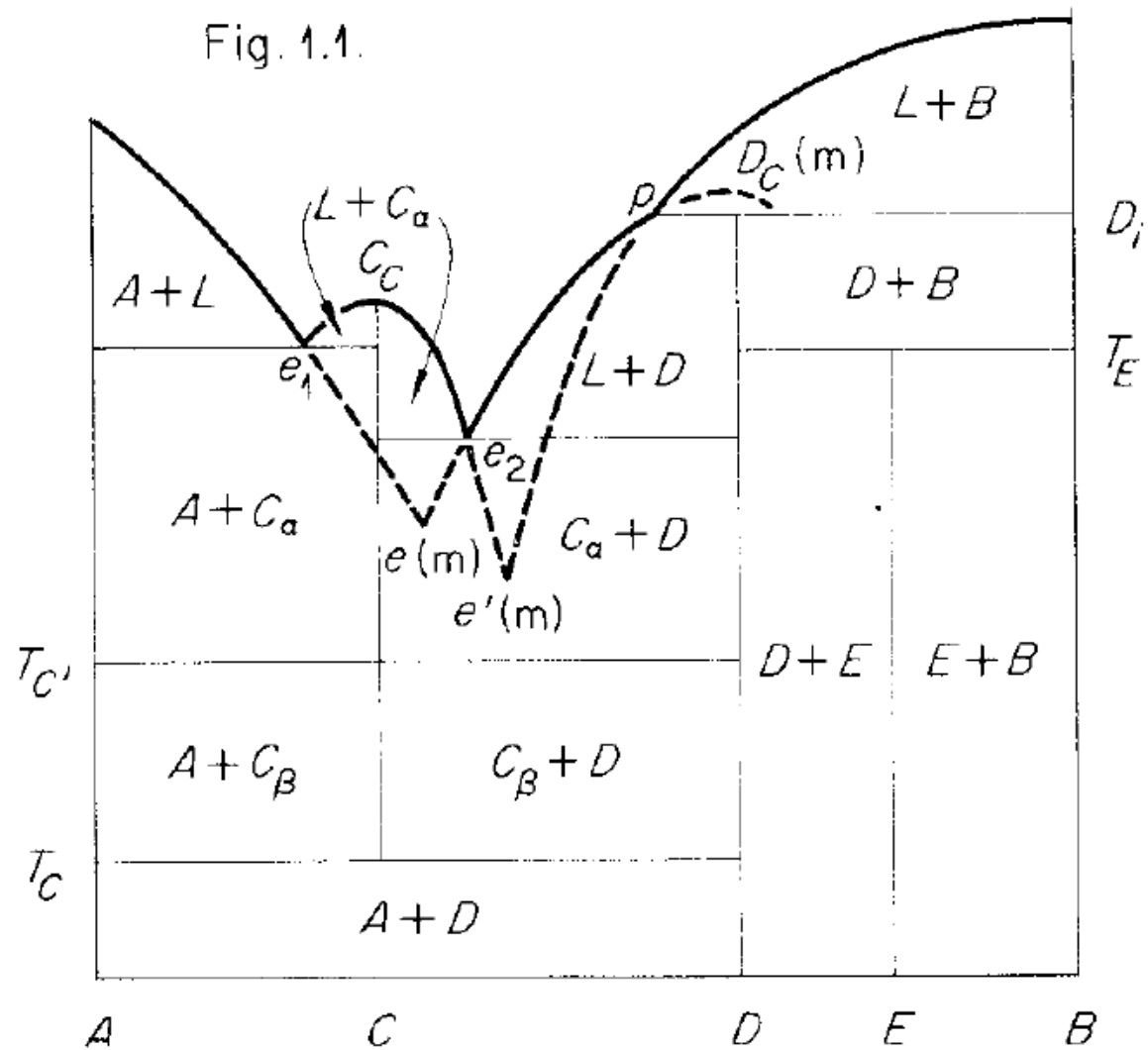
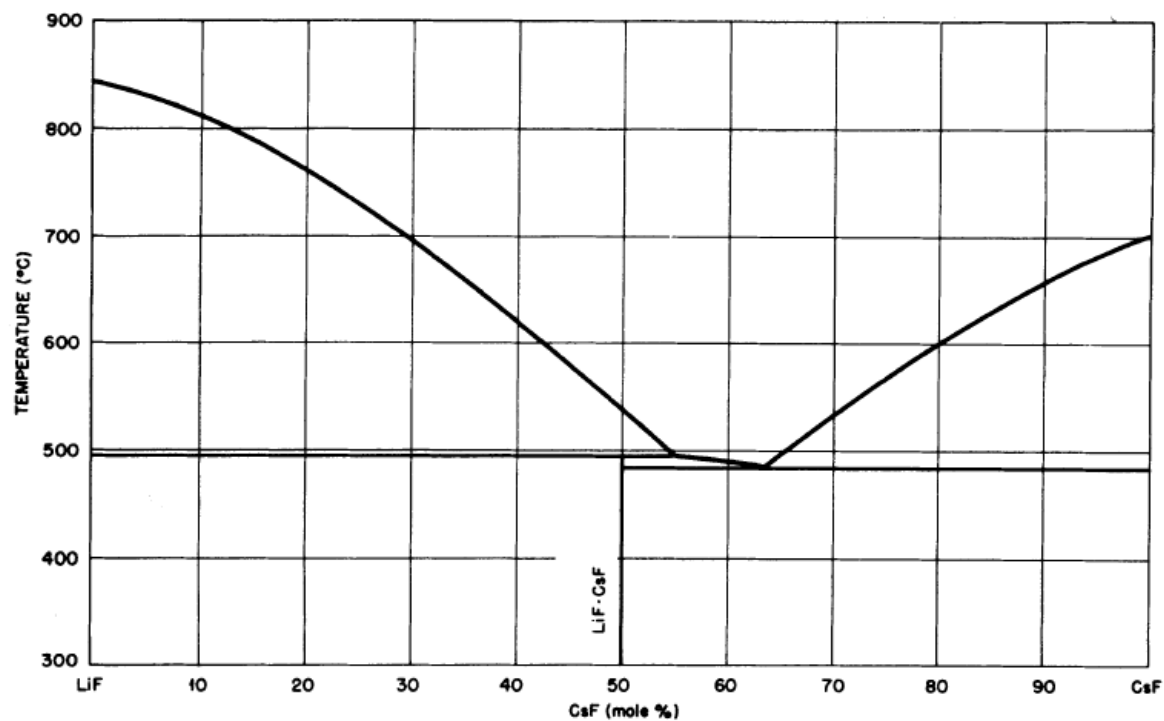
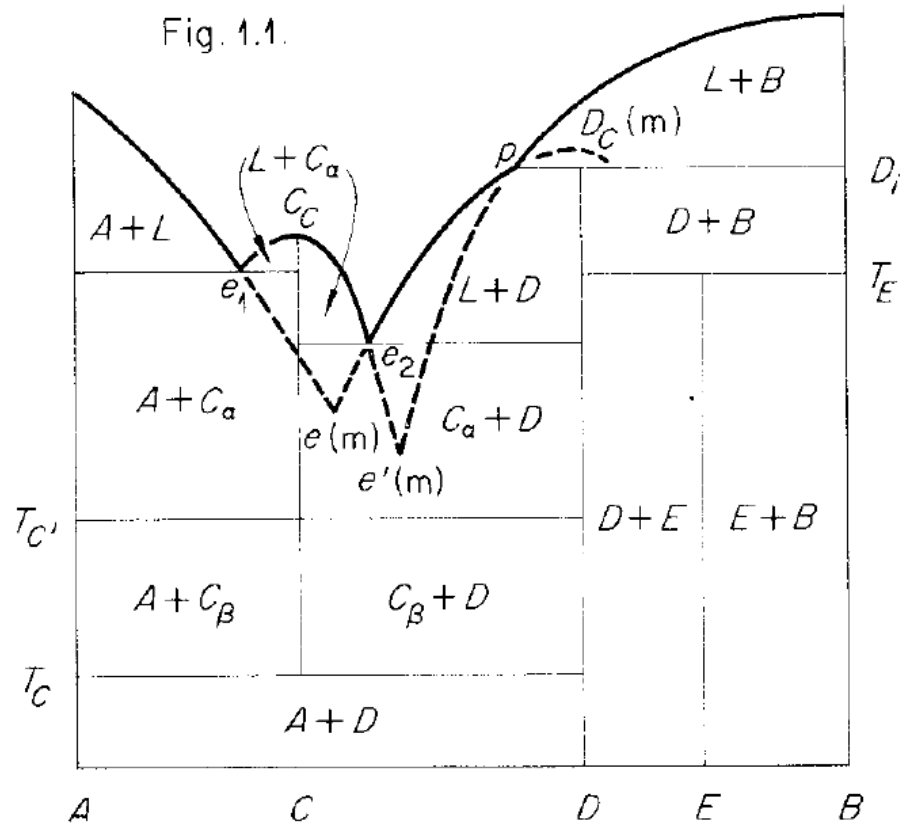


Fig. 1.3.

Concepts

1. New solid compounds
2. E: subsolidus (does not reach liquid phase)
3. C_c : congruent melting
4. D_c : incongruent melting (D decomposes before it melts)
5. Congruence melting depends on:
 1. MP of solid
 2. MP of compound
 3. Degree of dissociation of compound in the melt



Concepts

1. Solid solutions

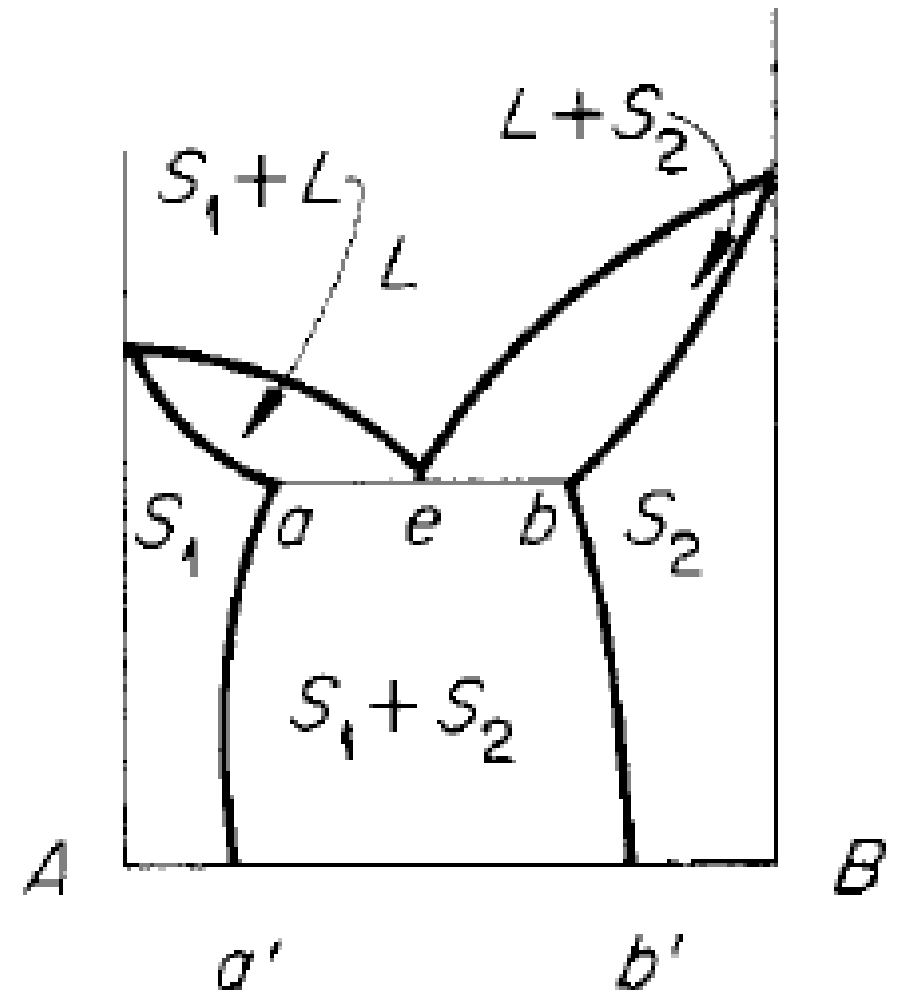


Fig. 1.8.

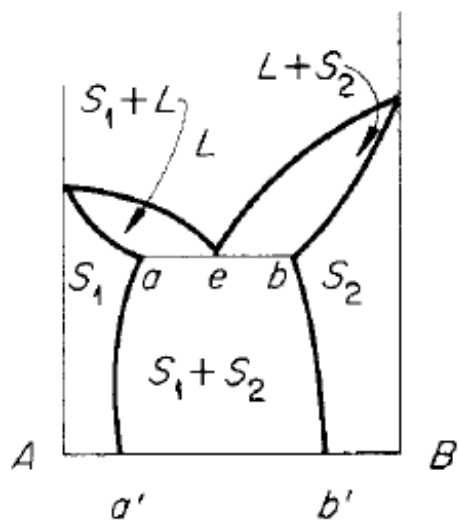
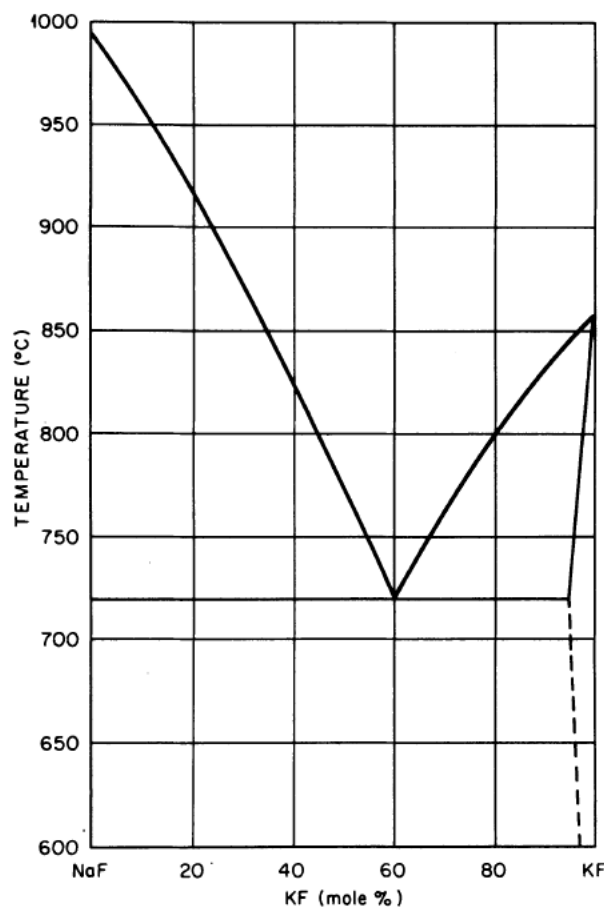


Fig. 1.8.

Fig. 5. The system NaF-KF.



The System NaF-RbF. See Fig. 6. Source: C. J. Barton, L. M. Bratcher and W. R. Grimes, ORNL, unpublished work (1951). Barton

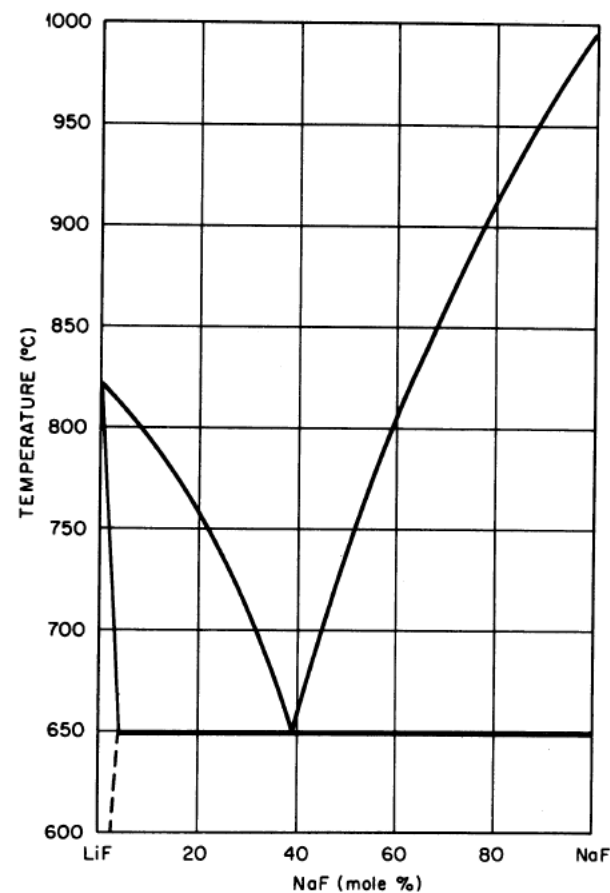


Fig. 1. The system LiF-NaF.

The System LiF-KF. See Fig. 2. Source: A. G. Bergman and E. P. Dergunov, *Compt. Rend. Acad. Sci. URSS* 31:753 (1941). $E = 492^\circ$, 50% KF.

Fig. 1.1.

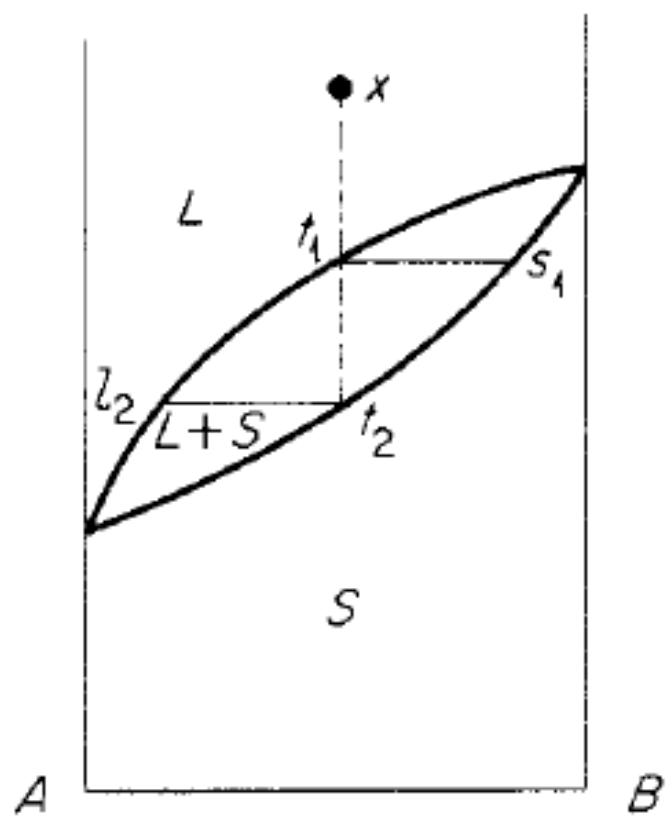


Fig. 1.6.

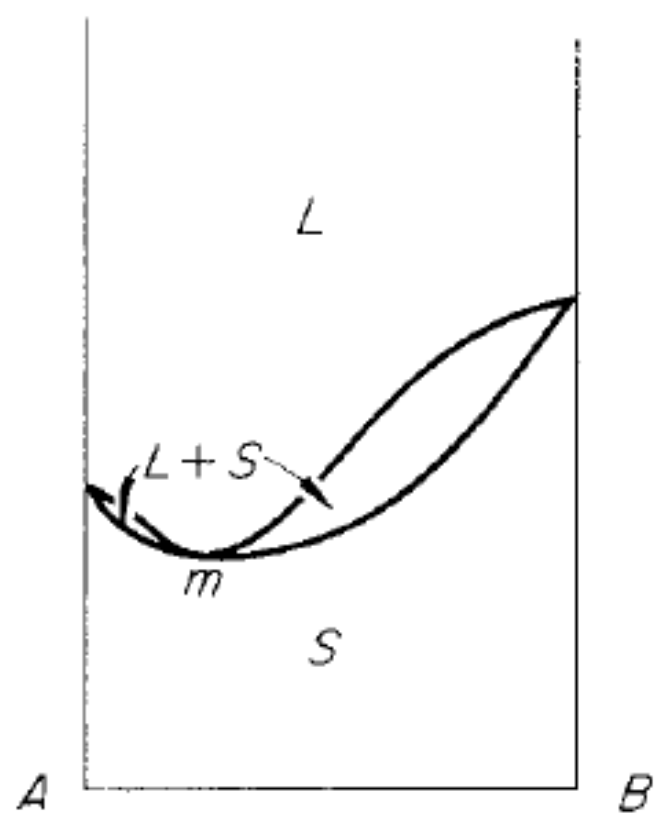
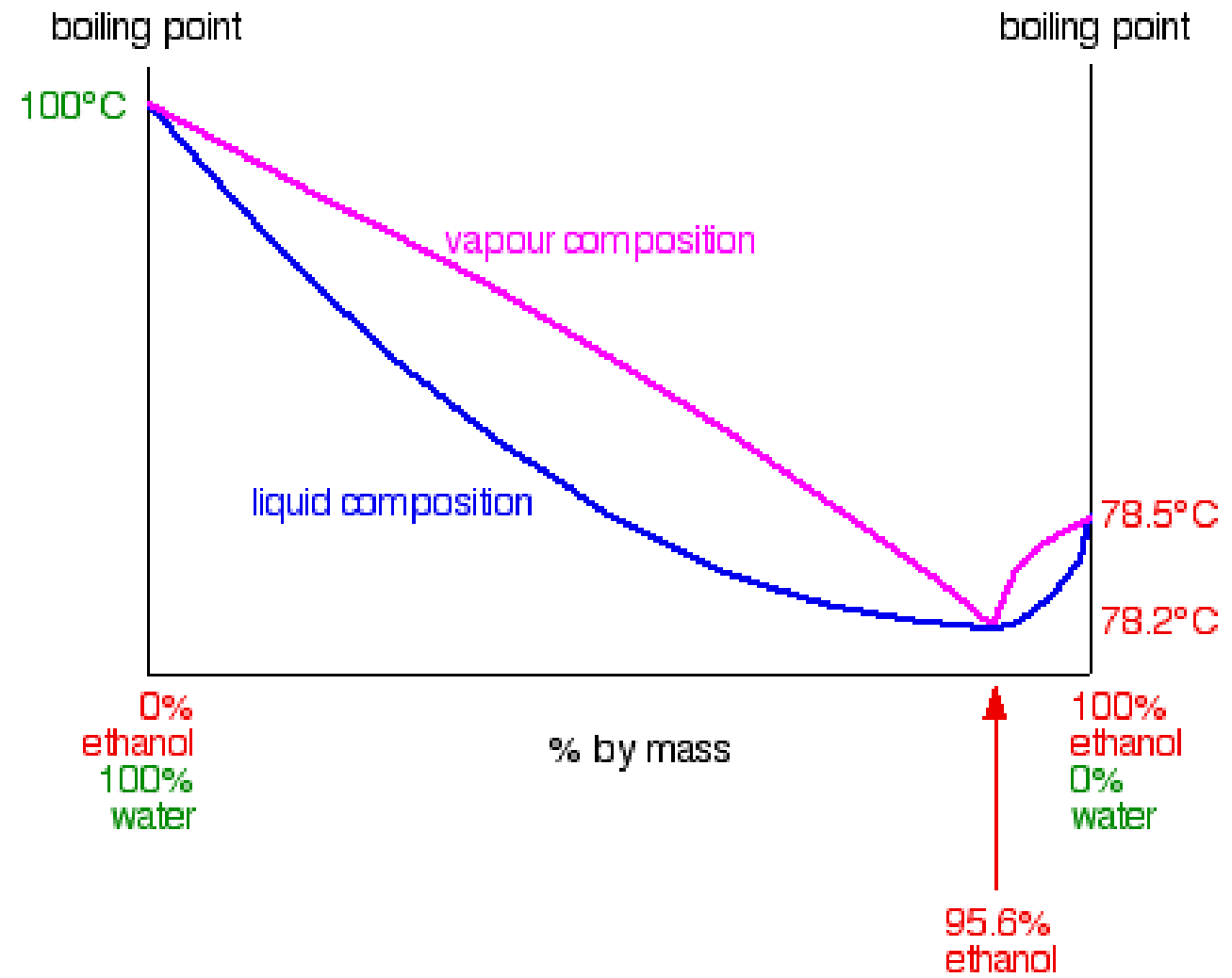
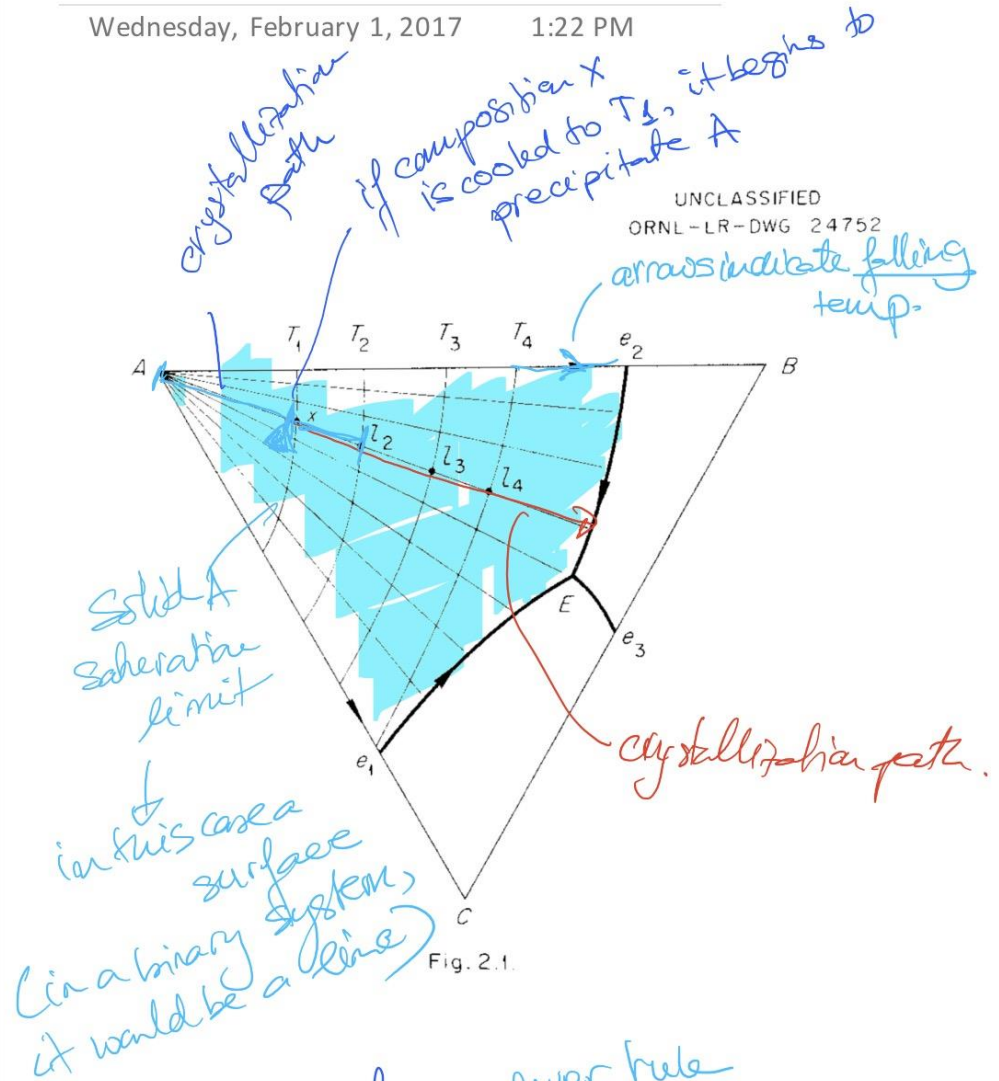


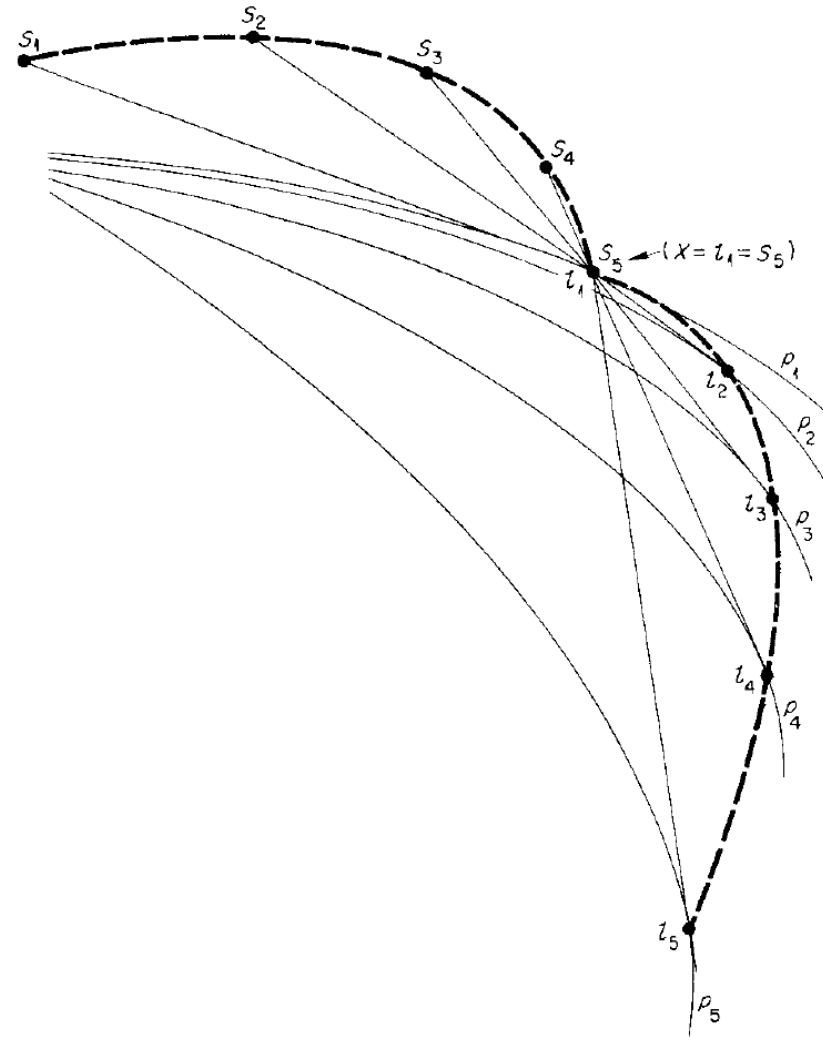
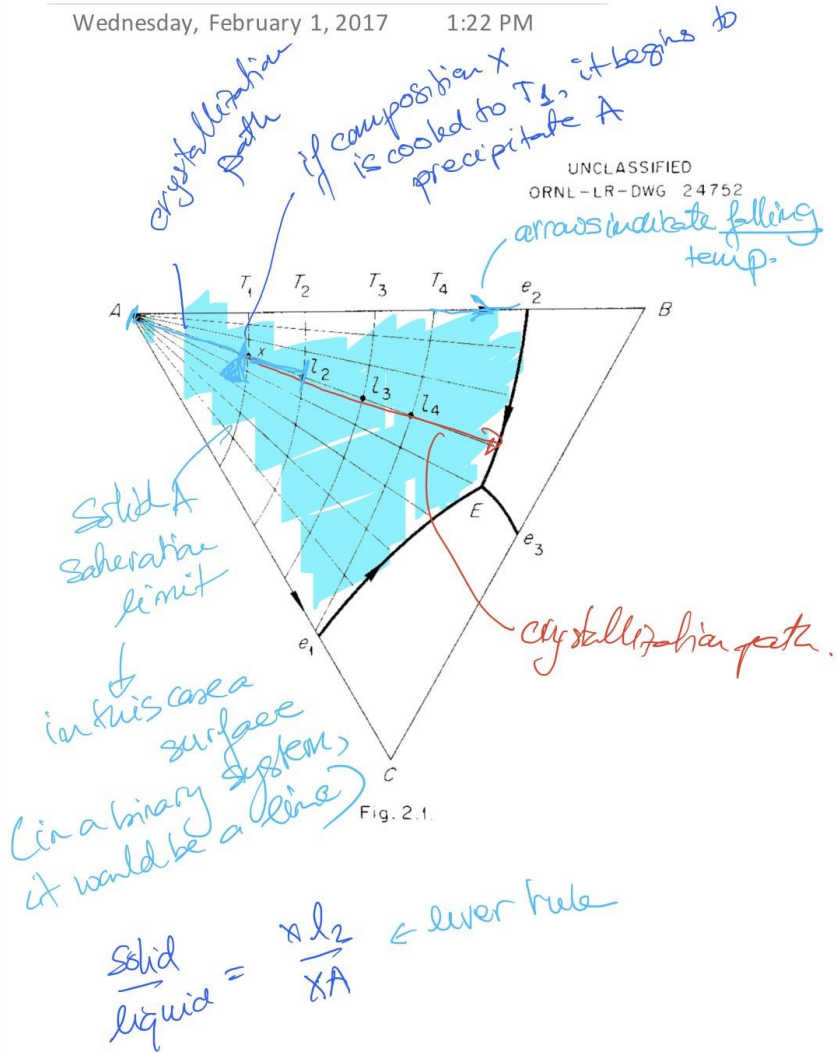
Fig. 1.7.



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$$\frac{\text{Solid}}{\text{Liquid}} = \frac{x l_2}{x_A} \leftarrow \text{lever rule}$$



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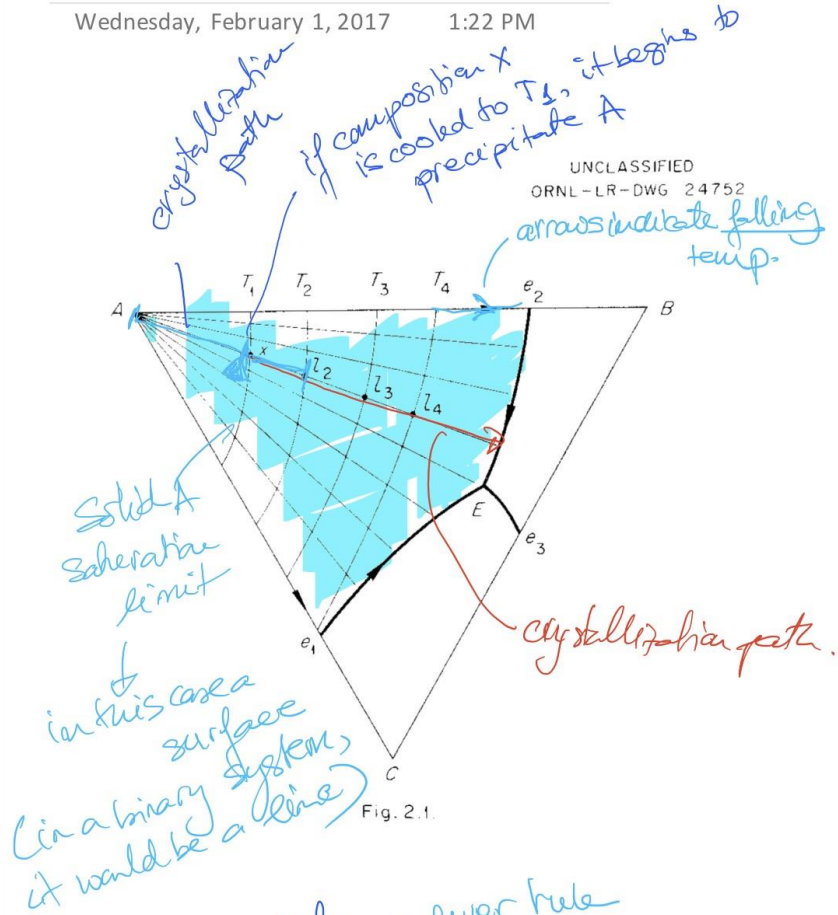


Fig. 2.1

lever rule

$$\frac{\text{solid}}{\text{liquid}} = \frac{x l_2}{x A}$$

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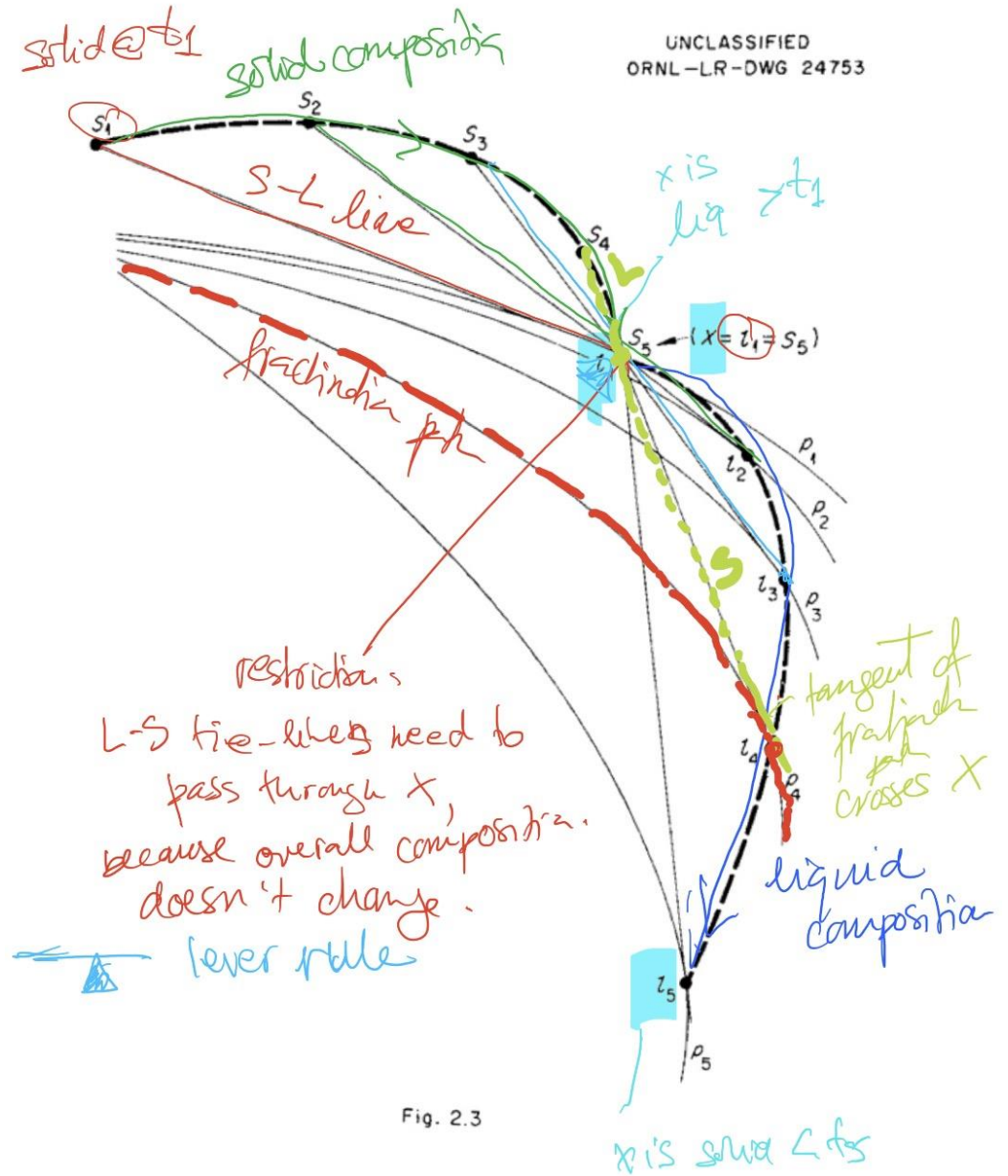


Fig. 2.3

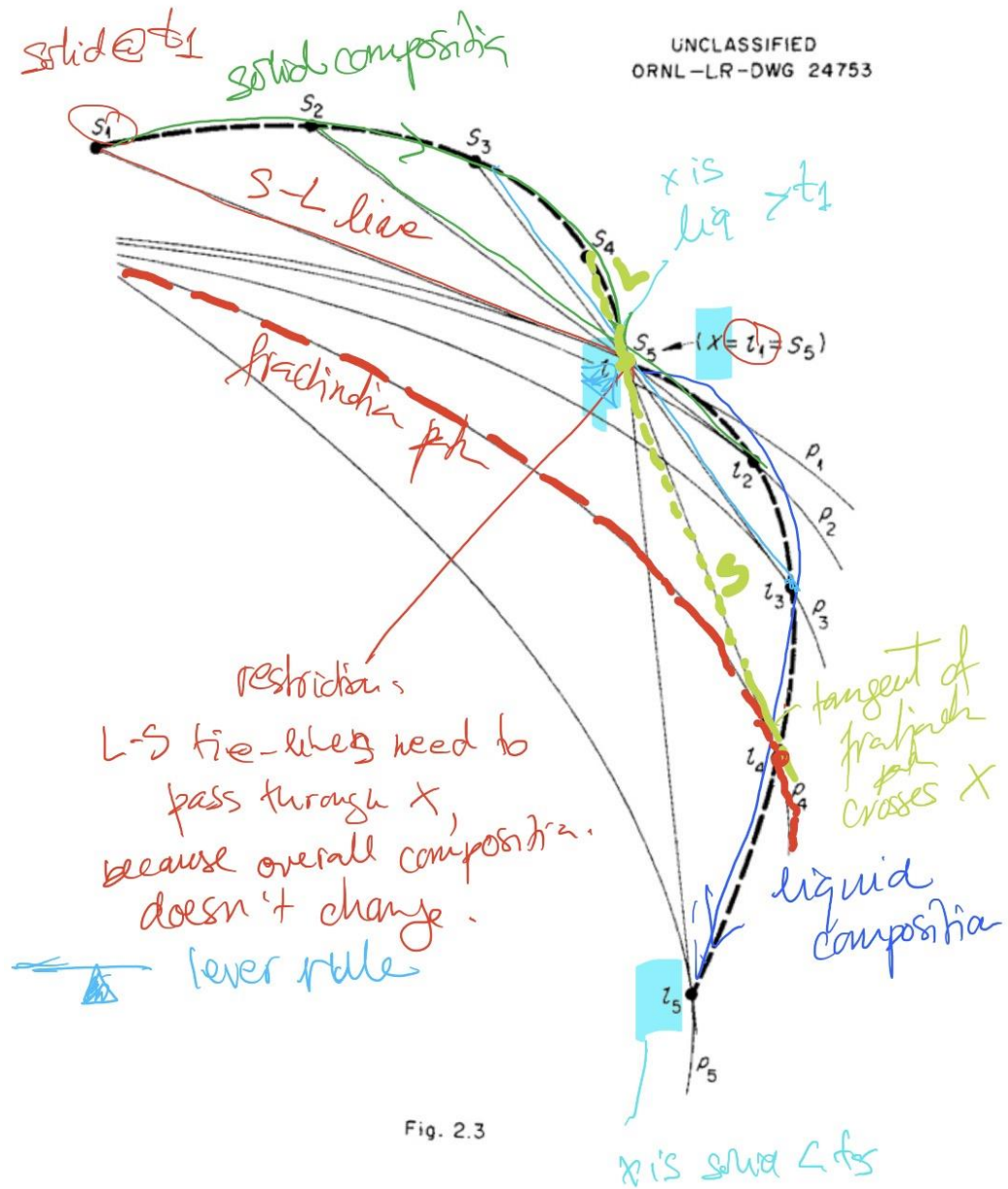


Fig. 2.3

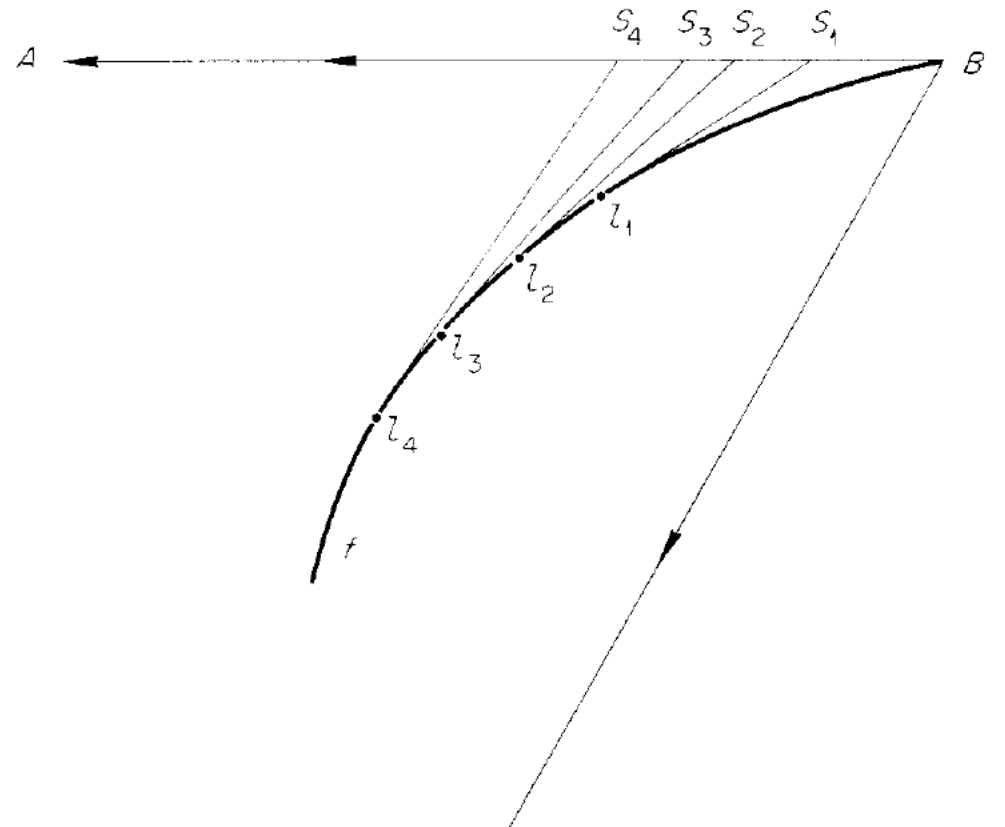


Fig. 2.2.